Welcome

Environmental Advisory Board Meeting

Robins Air Force Base

August 6, 2009

Welcome and Program Introduction

Ms. Becky McCoy
EAB Installation Co-chair

ACRONYMS & ABBREVIATIONS

- AFB – Air Force Base
- CCTV – Closed Circuit Television
- HDPE – High Density Polyethylene
- PVC – Polyvinyl Chloride
- PE – Polyethylene

Environmental Advisory Board

Utilizing Trenchless Technologies for Water Main Upgrades at Robins Air Force Base (AFB)

Jonathan Raymer, P.E.
Tepa EC, Warner Robins, Georgia

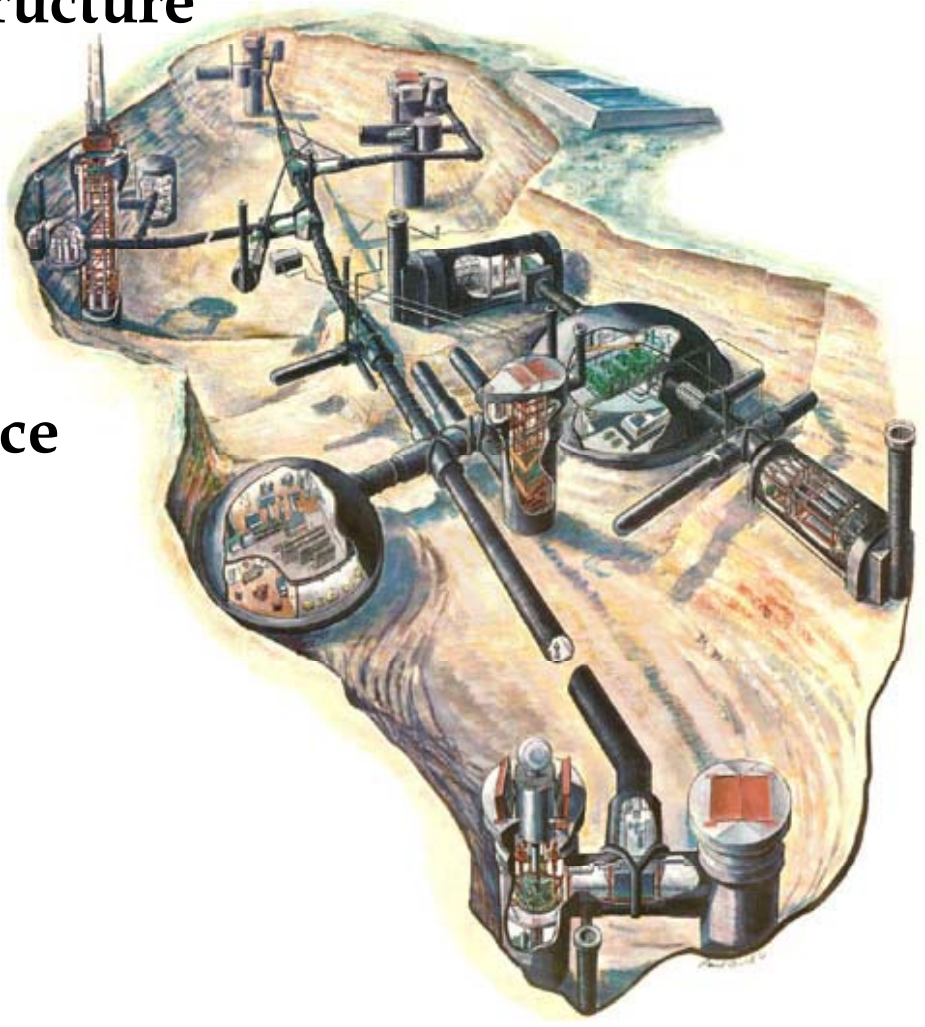
August 6, 2009

OVERVIEW

- Background
- Trenchless Technologies
- Benefits of Trenchless Technologies
- Overview of Pipe Bursting
- Water Main Upgrade at Robins AFB
- Summary
- Questions/Comments

BACKGROUND

- **Underground Utility Infrastructure**
  - **Arteries of our cities and communities**
  - **Industrial and sanitary sewers**
  - **Drinking water conveyance**
  - **Storm water conveyance**
  - **Communication lines**



BACKGROUND

- **Most Underground Infrastructure Across the United States is Over 50 Years Old**
  - **Operating beyond original design life**
  - **Beginning to see signs of problems**
    - Sinkholes
    - Interruption in service from broken lines
    - Overloading treatment plants from storm water and groundwater leaks into broken lines

Sinkhole at Georgia Tech – 32 feet deep
Caused by rainwater leaking into broken sewer pipe

BACKGROUND

- **Water Distribution Lines**
  - **Problems**
    - Encrusted
    - Corroded
  - **Consequences**
    - Leaking (losses up to 40%)
    - Loss of capacity
    - Red/rusty water
    - Erosion and washouts

Loss of potable water puts strain on water resources

Sinkhole from leaking water line

BACKGROUND

- **Wastewater Collection Lines**
  - **Problems**
    - Offset pipes
    - Leaking joints
    - Root intrusion
  - **Consequences**
    - Infiltration/Inflow
    - Reduced capacity
    - System backups
    - Spills and overflows
    - Erosion and sinkholes

Deteriorated piping allows infiltration overwhelms collection systems and treatment plants

BACKGROUND

- **What are the True Costs of Our Aging Infrastructure?**

Environmental impacts

Public safety concerns

Increased long-term construction costs

BACKGROUND

- **Challenges to Upgrading our Infrastructure**
  - **High cost to excavate below streets, sidewalks, and buildings**
  - **Disruption to traffic, businesses, and other activities**
  - **Location and condition of utilities commonly unknown or unclear**

TRENCHLESS TECHNOLOGIES

- **One Solution to the Challenges of Upgrading our Underground Infrastructure**
  - **Trenchless Technologies Provides**
    - Methods for installing new utilities or to replace and/or repair existing utilities
    - Long - term solutions with design life exceeding 50 years
    - A means to installing pipes from as small as 1-inch up to 110-inches
    - Several alternatives but not a silver bullet

Slip lining utility pipe

Robotic Cutter

TRENCHLESS TECHNOLOGIES

Types of Trenchless Technologies

Trenchless Rehabilitation

- Technologies Replace or Repair Existing Utilities
  - Pipe bursting
  - Cured in place pipe
  - Internal joint seals
  - Structural coatings
  - Thermoformed lining
  - Slip lining

Trenchless Construction

- Technologies Provide New Utilities Where None Exist
  - Directional drilling
  - Tunneling
  - Micro tunneling
  - Directional boring
  - Pipe ramming
  - Moling

TRENCHLESS TECHNOLOGIES

- **Trenchless Applications**
  - **Pipeline assessment – robotic closed circuit television (CCTV)**
  - **Pipelining – cured-in-place pipe provides pipe inside existing pipe**
  - **Pipe bursting – replaces existing pipe with minimal excavation**

TRENCHLESS TECHNOLOGIES

- **Trenchless Applications**
  - **Manhole rehabilitation – epoxy and cement based lining systems seal manholes**

  - **Internal joint seals – installed without excavation, provides water tight seal**

  - **Directional drilling – install conduit and casing without trenching**

TRENCHLESS TECHNOLOGIES

Trenchless Applications

Common Utility Problems	Trenchless Solutions				
	CCTV	Pipe Bursting	Pipe Lining	Internal Seals	Manhole Rehab
Unknown quantities, location, condition of infrastructure	✦				
Inadequate pressure and flows for fire suppression or potable water		✦			
Water main breaks		✦	✦	✦	
Infiltration and inflow increasing volume of water to be treated	✦	✦	✦	✦	✦
Sink holes and pavement settling over underground utilities	✦	✦	✦	✦	✦
Fluid escaping from industrial / sanitary lines	✦	✦	✦	✦	✦
Excavating to find and fix problems	✦	✦	✦	✦	✦
Pipe repairs in sensitive areas e.g. contaminated soil, runways, buildings	✦	✦	✦	✦	✦
Odor complaints	✦	✦	✦	✦	✦
Potable water distributed through asbestos pipe		✦			

BENEFITS OF TRENCHLESS TECHNOLOGIES

- **Typically More Cost Effective – Reduces or Eliminates Costs Associated with:**
  - **Removal of asphalt or concrete**
  - **Excavation**
  - **Hauling**
  - **Fill material and compaction**
  - **Disposal**
  - **Replacement of asphalt or concrete**
  - **Other**
    - Disruption to critical operations
    - Business failures
    - Unhappy citizens
    - Traffic congestion

Traditional excavation to repair/replace utilities

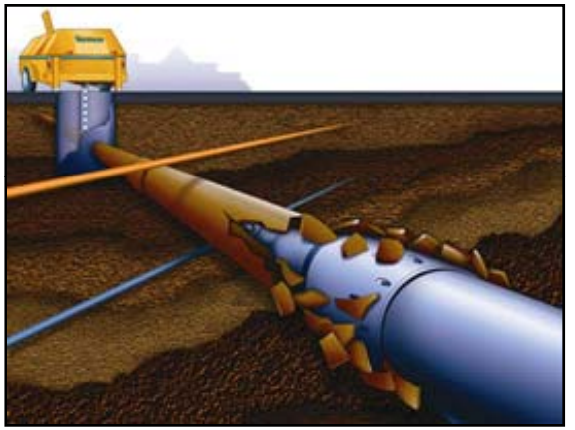
BENEFITS OF TRENCHLESS TECHNOLOGIES

- **Minimizes Road Closures**
- **Provides Access to Utilities Beneath Buildings, Roadways, and Landscaping without Disruption**
- **Allows for Replacement of Hazardous Materials such as Asbestos Cement Piping while minimizing exposure to workers**

Asbestos cement piping

OVERVIEW OF PIPE BURSTING

- **Selected Trenchless Technology - Pipe Bursting**
  - **Breaking existing pipe while simultaneously pulling in the new carrier line**
  - **Usually HDPE but Ductile Iron, Steel, and PVC can be used**
  - **Pipe pulling distances**
    - 0 – 350′ (very common)
    - > 1,000′ are rare but done
  - **Pipe diameter same size or one size larger common**
  - **Surface cover needed**



Pipe bursting steps

OVERVIEW OF PIPE BURSTING

- **Pipe Bursting Replaces Many Types of Pipe**
  - **Cast Iron**
  - **Clay tile**
  - **Concrete**
  - **Reinforced concrete**
  - **Asbestos cement**
  - **Polyethylene (PE) and Polyvinyl chloride (PVC)**
  - **Ductile iron**
  - **Steel**

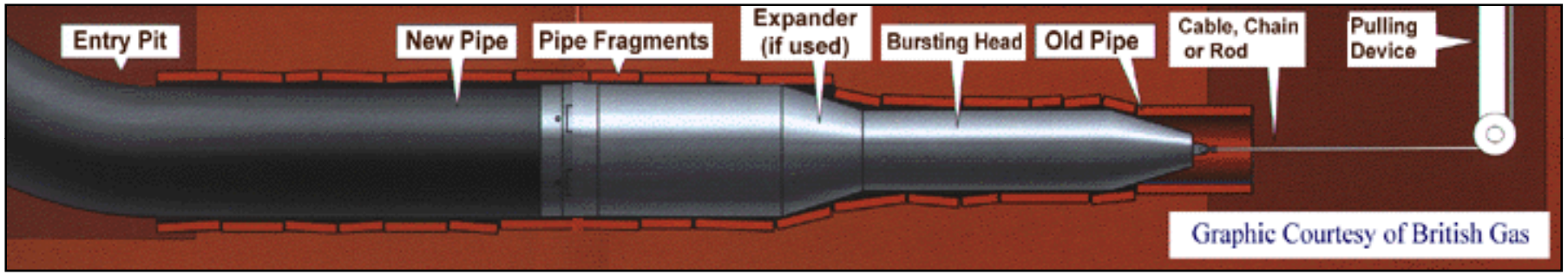
Vitrified clay pipe

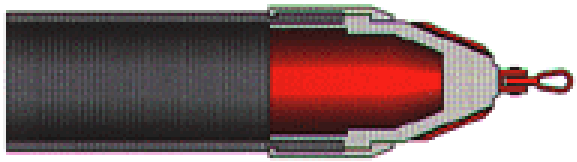
Ductile iron pipe

Cast iron pipe

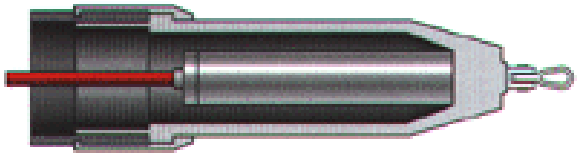
OVERVIEW OF PIPE BURSTING

- **Pipe Bursting Overview**

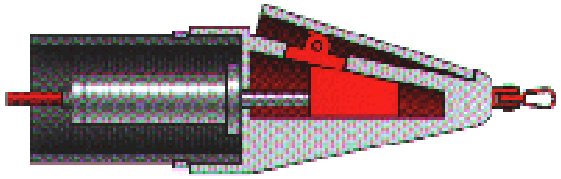




Static Head - The head is simply pulled through the old pipe by a heavy-duty pulling device (no internal moving parts)



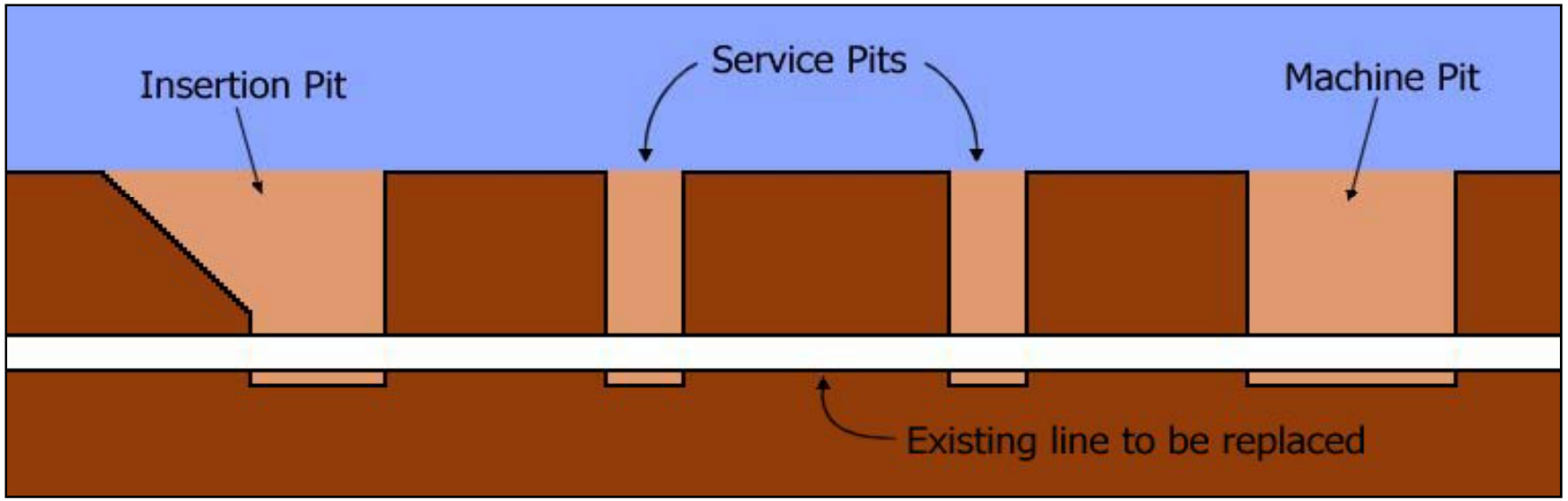
Pneumatic Head - Uses pulsating air pressure to drive forward and burst old pipe



Hydraulic Head - Expands as it is pulled through, bursting both the old pipe and heavy joints

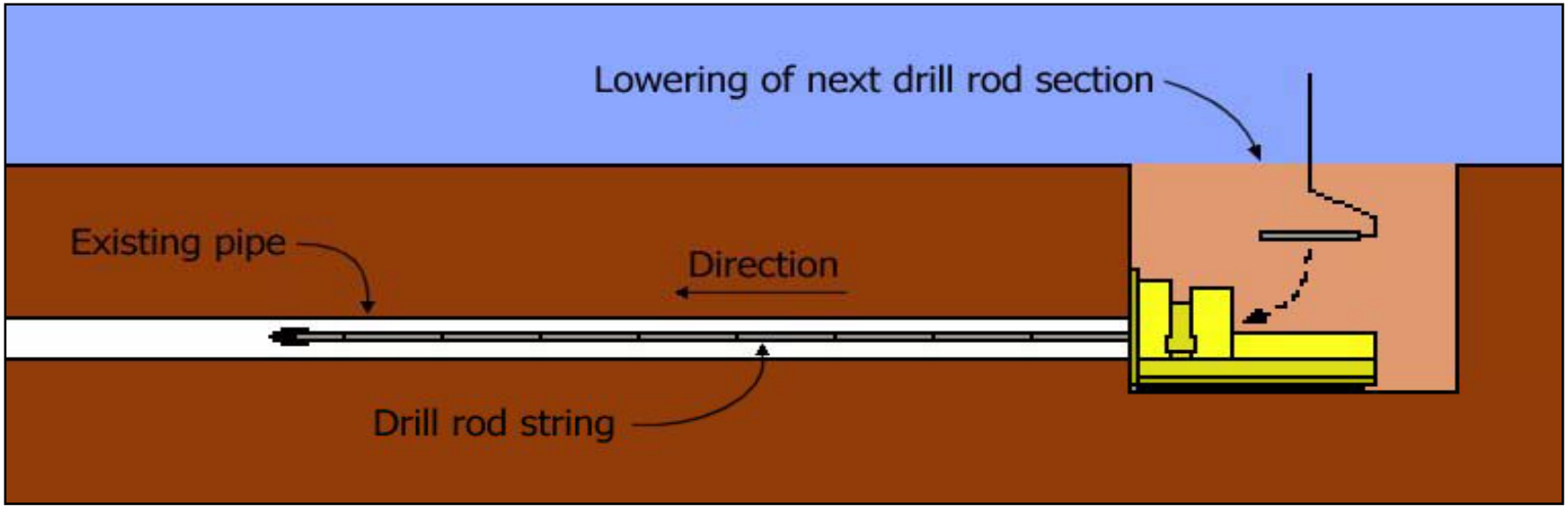
OVERVIEW OF PIPE BURSTING

- **Pipe Bursting Process – Step 1**
  - **Inspect existing sewer by CCTV**
  - **Excavate machine and new pipe insertion pits**
  - **Excavate service pits, if required**
  - **Pits should be properly shored and maintained dry**



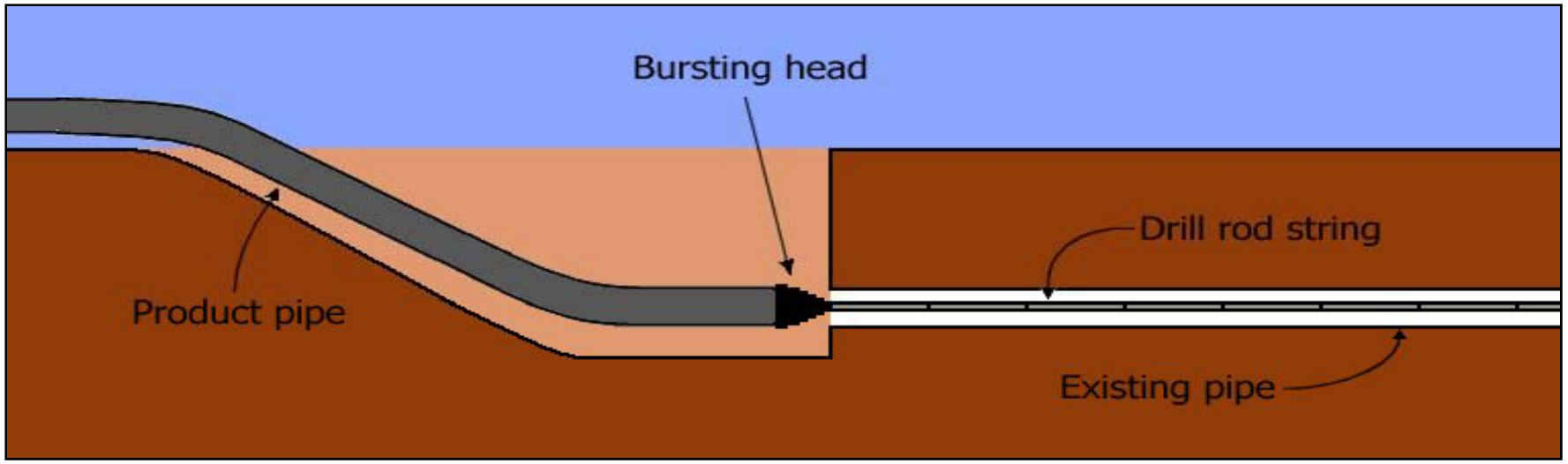
OVERVIEW OF PIPE BURSTING

- **Pipe Bursting Process – Step 2**
  - **Prepare machine pit**
  - **Set up pipe bursting machine in pit**
  - **Push rod string through existing pipe from machine pit to new pipe insertion pit**



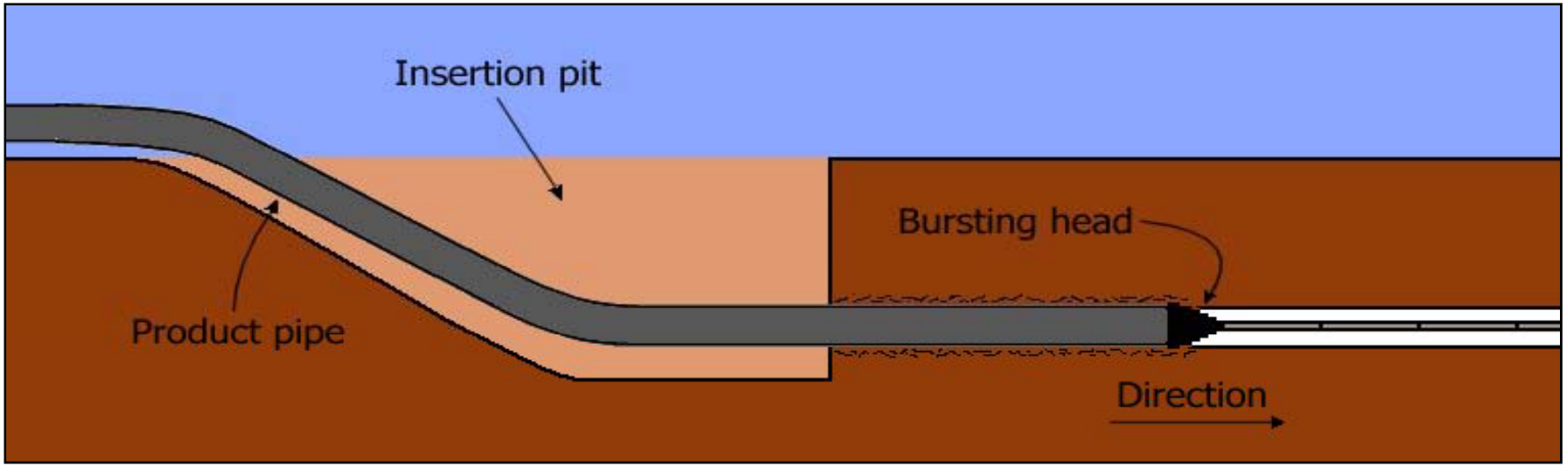
OVERVIEW OF PIPE BURSTING

- **Pipe Bursting Process – Step 3**
  - **Rod string emerges at new pipe insertion pit**
  - **Attach pipe bursting head and new replacement pipe to the rod string**
  - **HDPE pipe already fused into a single continuous length and ready for pull back replacement process**



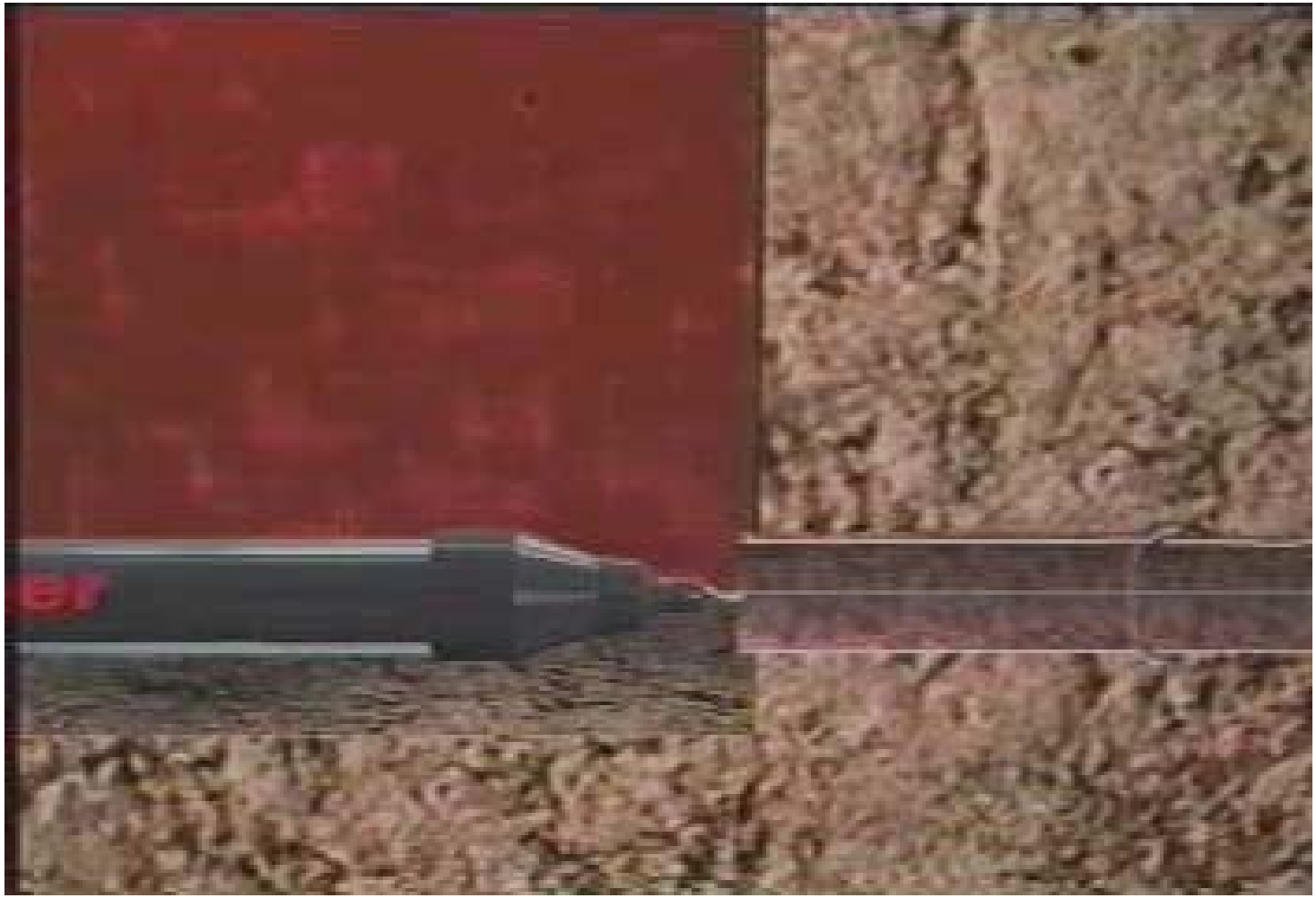
OVERVIEW OF PIPE BURSTING

- **Pipe Bursting Process – Step 4**
  - **Rod string pulls bursting head towards machine pit**
  - **Bursting head breaks existing pipe and pushes broken pieces into surrounding ground, creating a new tunnel**
  - **Bursting head advances towards machine pit and installs new HDPE pipe in place**



OVERVIEW OF PIPE BURSTING

- **Pipe Bursting Process (Video)**



OVERVIEW OF PIPE BURSTING

- **Pipe Bursting Process (Video)**

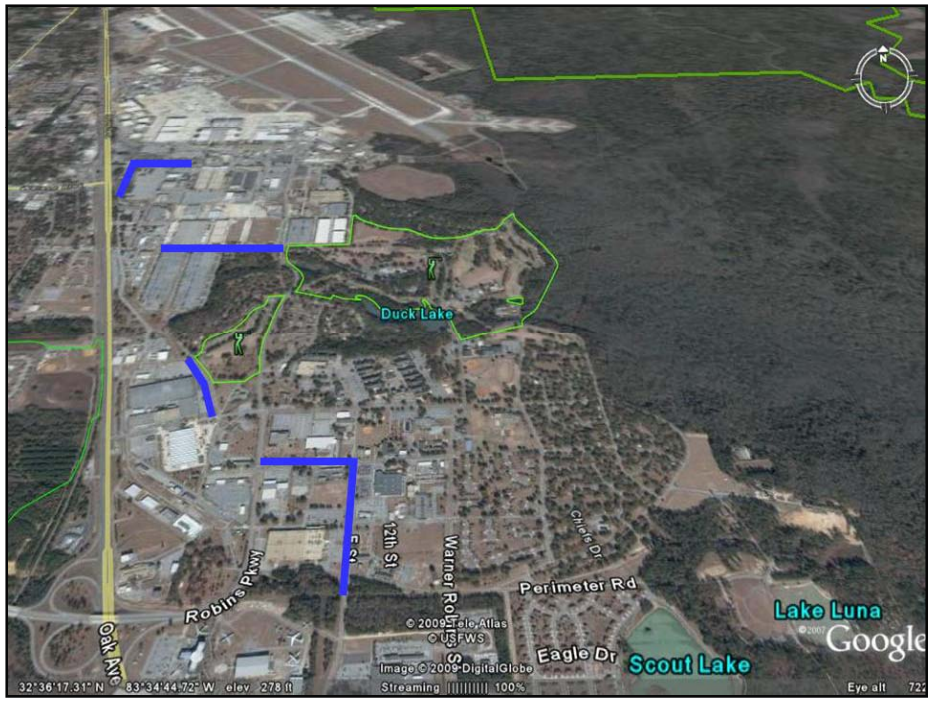
OVERVIEW OF PIPE BURSTING

- **Benefits of Pipe Bursting**
  - Installs a new pipe
  - Eliminates up to 85% of excavation
  - Prevents damage – follows path of existing utility reducing risk of utility strikes
  - Reduces project engineering expense when compared to utility relocation design
  - Allows for increase in pipe size
  - Proven technology

Typical excavation for pipe bursting

WATER MAIN UPGRADE AT ROBINS AFB

- **Project – Replace Asbestos Cement Water Mains, Valves, and Hydrants**
  - Asbestos cement water mains operating beyond original design life
  - Water mains required periodic point repairs
  - Located under sensitive areas including live electric lines and active traffic flow
  - Daily operations sensitive to loss of water service during construction
  - Underground utility conflicts and water mains routed through storm water structures



Aerial Photo of Robins AFB

Location of replaced water main

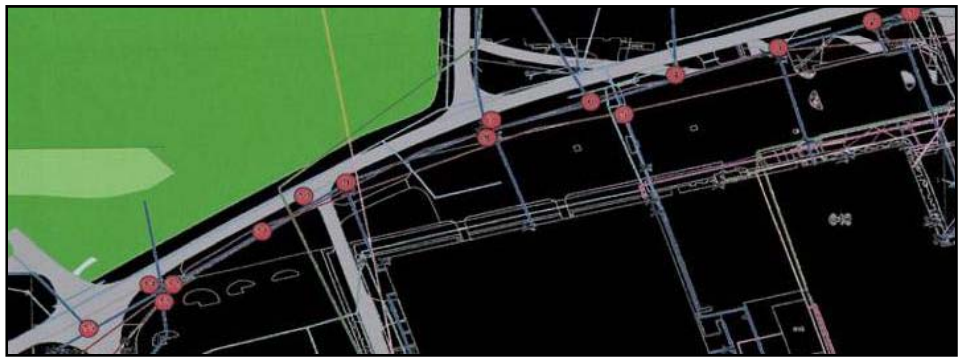
WATER MAIN UPGRADE AT ROBINS AFB

- **Project Approach**
  - **Planning**
  - **Preparation**
    - High density polyethylene (HDPE) fusing
    - Pre-chlorination and testing
    - Excavation and confirmation
    - Valve and tee assembly
  - **Water main replacement**
  - **Valve and hydrant replacement**
  - **Restore service**
  - **Restore site**

Page Road water main replacement site

WATER MAIN UPGRADE AT ROBINS AFB

- **Planning**
  - **Work awarded as design build**
  - **Complete investigation of existing system**
  - **Design new system**
  - **Submit plans for regulatory approval**
  - **Coordinate with Fire Department and other Base personnel**
  - **Selected pipe bursting as trenchless technology to complete water main upgrade**



Location of water main replacement along Page Road

Page Road

WATER MAIN UPGRADE AT ROBINS AFB

- **Preparation**
  - **HDPE fusing**

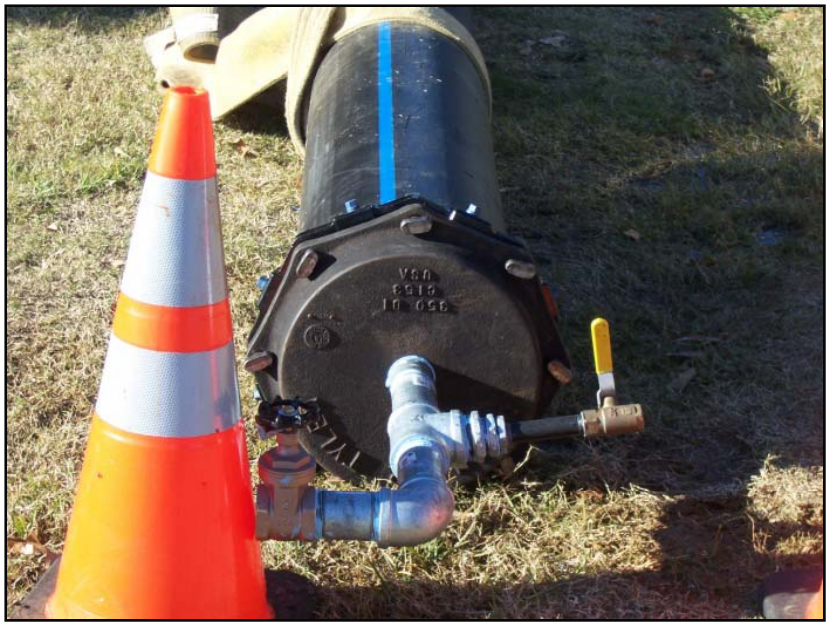
HDPE pipe storage on-site

HDPE pipe fused on-site

HDPE pipe welding/fusing machine

WATER MAIN UPGRADE AT ROBINS AFB

- **Preparation**
  - **Pre-chlorination and testing**



Valve assembly for disinfection of HDPE pipe

Injection of disinfection fluid into HDPE pipe

WATER MAIN UPGRADE AT ROBINS AFB

- **Preparation**
  - **Excavation and confirmation**

Exposing existing water pipe

Exposing existing utilities

Erosion control

Safety fence

WATER MAIN UPGRADE AT ROBINS AFB

- **Preparation**
  - **Valve and tee assembly**

Assembling fittings

Preparing valves

New valves and fire hydrants

WATER MAIN UPGRADE AT ROBINS AFB

- **Water Main Replacement**

Removing existing pipe at access pit

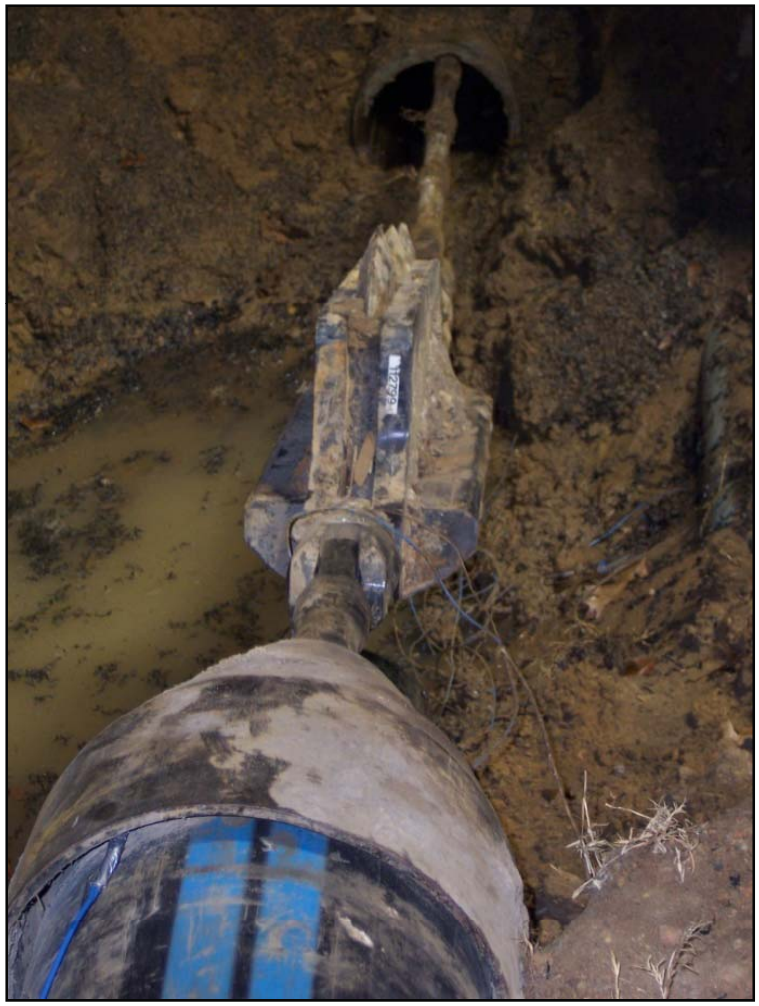
Pipe bursting access pit

Removal of existing water main

WATER MAIN UPGRADE AT ROBINS AFB

- **Water Main Replacement**

Pipe bursting pulling equipment



New HDPE pipe being pulled in place

WATER MAIN UPGRADE AT ROBINS AFB

- **Water Main Replacement**

Splitter entering existing pipe

Installation of new of HDPE pipe

Expander head entering existing pipe

WATER MAIN UPGRADE AT ROBINS AFB

- **Valve and Hydrant Replacement**

Installing new valve assembly

Lowering new valve in place

New valves installed

WATER MAIN UPGRADE AT ROBINS AFB

- **Restore Service**

New pipe and valve installed

New fire hydrant installed

Thrust block

WATER MAIN UPGRADE AT ROBINS AFB

- **Restore Site**

Erosion control matting

Access pit restoration

Hydro seeding disturbed area

WATER MAIN UPGRADE AT ROBINS AFB

- **Project Results**
  - **Completed scope of work on time and under budget**
  - **Successfully maintained water service for critical operations**
  - **Zero utility strikes**
  - **No interruption to vehicular and pedestrian traffic**

Page Road water main replacement site

SUMMARY

- Much of the Underground Utility Infrastructure across United States is Reaching End of Its Design Life
- Beginning to See Signs of Problems
  - Sinkholes
  - Interruption in service
  - Reduced flows
  - Overloaded treatment plants
- High Cost to Repair or Replace Using Traditional Excavation Technologies
- Trenchless Technologies Offer One Solution
- Robins AFB Proactively Upgrading Underground Infrastructure

QUESTION / COMMENTS

Contact Information:

Jonathan Raymer, PE
Utility Program Manager
jonathan.raymer@tepa.com
(770) 616-7523

New Business
and
Program Closing

Ms. Becky McCoy

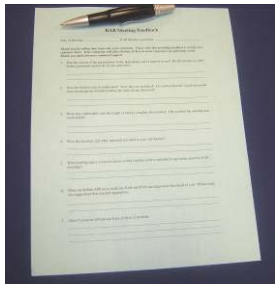
EAB Installation Co-chair

Next EAB Meeting

Thursday, 5 November, 2009

Please…

Complete the meeting evaluation and feedback form



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Thank you!